



## ***Denali Science School*** ***- Systems and Stewardship -*** **Teacher Information Packet**



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## Goals and Objectives

Denali Science School is a hands-on science education program for Alaska students in fifth and sixth grades. During a three-day, two night stay at the Murie Science and Learning Center (MSLC) in Denali National Park and Preserve, students conduct investigations, participate in discussions and collaborative activities, play games, and hike as they address the overall goals of Denali Science School and explore the three main learning objectives.

### Goals:

- ❖ Acquaint students with the habitats of Denali National Park and Preserve (tundra, taiga, rocky alpine, gravel bar, and subnivean) and to show how they are interconnected with each other.
- ❖ To understand how scientist/management protect National Parks.

### Objectives:

(Students will explore and learn about...)

- ❖ The tools and methods scientists use to understand the natural world.
- ❖ The four main habitats found in Denali, how are they interconnected, and how are they impacted by changes.
- ❖ How the National Park Service provide visitors with access to natural resources while protecting those resources.

## Overview

The primary Alaska State Standards that are addressed revolve around food chains, food webs, and transfer of energy within each, soil properties, and application of the scientific process. The themes of the program are systems and stewardship. Each activity helps students understand that ecosystems are made up of interdependent living and non-living elements that support the structure and health of that system, and that we are all stewards of our public lands and must understand the science behind ecological systems in order to be effective land managers.

Ecosystems in Denali are fundamentally influenced by permafrost conditions throughout the park. For this reason understanding how permafrost shapes the subarctic landscape and ecosystems is the jumping off point for the lessons. Students engage in authentic scientific research by collecting data from permafrost monitoring sites and discussing their findings. Understanding the role of permafrost in the park (and other parts of Alaska) helps students understand the importance of protecting it from human impacts, and monitoring its condition as a way to mitigate the effects of human impacts.

Once students understand the role of permafrost in Denali, they learn about the different living organisms that are found in the park and how they interact. Students discover that some organisms can be a part of many different food webs and ecosystems, while others are limited to just one. They also learn how changes in climate and other factors are already impacting some species. This understanding leads students to hypothesize about how an ecosystem might change if some element of that system, living or non-living, ceased to function in its normal capacity. They begin to see how local and non-local impacts can have wide-ranging effects.

In their culminating activity, students work in small, collaborative groups to create their own national parks. Through this activity, students address the learning objectives as they consider how organisms interact within the ecosystems in their parks and how they can maintain the health of those ecosystems.

The students develop management plans for their park resources including the human visitors who depend upon the park. After creating a visual representation of their parks, the students give oral presentations where they address the essential questions through the explanations of their management plans of their parks.

### **About Us**

Denali Science School is collaboratively run by Denali National Park and Preserve and Alaska Geographic through the Murie Science and Learning Center. Both organizations provide instructors, supplies, funding and program management. All Science School program materials were developed by Rachel Jencks (Denali Education Specialist) and Nanette Melero (Denali Teacher-Ranger-Teacher, summer 2014), with inspiration, management, and oversight provided by Sierra McLane (Murie Science and Learning Center NPS Coordinator) and graphics assistance from Ellen Grover (Denali Science Communicator). Special thanks to Everglades National Park for program inspiration and to Doyon/Aramark Joint Venture for providing bus and food services.



### **Murie Science and Learning Center**

The Murie Science and Learning Center promotes science and stewardship on behalf of national parks in northern Alaska. The MSLC also serves as the Winter Visitor Center for Denali annually from mid-September through mid-May. The facility has classrooms, potable water, indoor restrooms (with sinks and flush toilets, no showers), and an adjacent dining facility.

Denali Science School takes place at the Murie Science and Learning Center (MSLC) within Denali National Park and Preserve. The MSLC is located at mile 1.2 of the Denali Park Road. After turning off of the George Parks Highway at Mile 237, take the first right at the roundabout and then turn into the first driveway on the right.

### **Denali National Park and Preserve**

The mission of Denali National Park and Preserve is to protect, intact, the globally significant Denali ecosystems, including their cultural, aesthetic, and wilderness values, and to ensure opportunities for inspiration, education, research, recreation, and subsistence for this and future generations.

Denali was originally established as Mt. McKinley National Park in 1917 to protect wildlife and its habitat. At that time there were many people living and hunting in this area, and they needed meat for themselves and their dog teams. The easiest source of meat was Dall sheep, and because of this the sheep were overhunted. Charles Sheldon, a hunter and naturalist, came to the Denali area in 1906 to study these sheep. Seeing the need to protect the sheep from extirpation, Sheldon lobbied Congress to turn the area into a national park. Congress agreed, and on February 26, 1917, designated about 2 million acres, including the highest point in North America, as Mt. McKinley National Park. Through the Alaska National Interest Lands Conservation Act of 1980, the park's name was changed and its acreage was tripled, so that today Denali National Park and Preserve covers more than 6 million acres. Almost the entire original 2 million acres are designated a wilderness area, and the entire park is managed as wilderness. More than 425,000 people visit this world-class national park every year.

## **Alaska Geographic**

Alaska Geographic is the official non-profit partner of Alaska's 15 national parks, 16 national wildlife refuges, and America's two largest national forests, plus a variety of other public lands. Alaska Geographic's mission is connecting people to Alaska's public lands because they believe that inspired people become champions of Alaska's parks, forests and refuges. Alaska Geographic was established in 1959 by rangers of what is now Denali National Park and Preserve.

## **Alaska State Performance Standards**

### ***Science***

- A1- Science as Inquiry and Process: Students develop an understanding of the processes and applications of scientific inquiry.
  - [5] SA1.1; [5] SA1.2; [5]SA2.1; [5] SA3.1
  - [6] SA1.1; [6] SA1.2; [6] SA3.1
- C1– Concepts of Life Science: Students develop an understanding of the concepts, models, theories, facts, evidence, systems, and processes of life science.
  - [5] SC2.1; [5] SC2.2; [5] SC3.1; [5] SC3.2
  - [6] SC1.2; [6] SC2.2; [6] SC3.1; [6] SC3.2
- D1 – Concepts of Earth Science: Students develop an understanding of the concepts, processes, theories, models, evidence, and systems of earth and space sciences.
  - [5] SD1.1; [5] SD2.1
  - [6] SD1.2; [6] SD2.1
- E1 – Science and Technology: Students develop an understanding of the relationships among science, technology, and society.
  - [5] SE1.1; [5] SE2.1
  - [6] SE1.1; [6] SE1.2; [6] SE2.2
- G1 – History and Nature of Science: Students develop an understanding of the history and nature of science.
  - [5] SG2.1
  - [6] SG2.1

### ***Math***

- Content Standard A: Mathematical facts, concepts, principles, and theories. Statistics and Probability: Formulate questions, gather and interpret data, and make predictions. – Students demonstrate an ability to classify, organize, and analyze data.
  - [5] S&P-1; [5] S&P-2
  - [6] S&P-1; [6] S&P-2
- Content Standard A: Mathematical facts, concepts, principles, and theories. Measurement: Select and use systems, units, and tools of measurement. – Students demonstrate understanding of measurable attributes.
  - [5] MEA-4; [5] MEA-8
  - [6] MEA-7

### ***Writing***

- The student writes for a variety of purposes and audiences.
  - [5] W2.2.2
  - [6] W2.2.2

### ***History***

- Colonial Era - The Russian period, Colonial Era - The United States Period, Alaska as a Territory, Alaska as a State: The student demonstrates an understanding of the discovery, impact, and role of natural resources.
  - AH.CPD1; AH.CPD2; AH.CPD3; AH.CPD5



# Schedule

## **Monday/Wednesday**

1:00-1:30 – Arrive and deposit gear  
1:30-1:45 – Habitat Game  
1:45-2:15 – Welcome and Orientation  
2:15-3:15 – Visitor Center Scavenger Hunt & Intro to habitats & ecosystems  
3:15-6:00 – Hike  
6:00-7:00 – Dinner at MSLC Dining Hall  
7:00-8:00 – Teacher Activities  
8:00-8:30 – Bedtime setup and wind-down  
8:30-9:00 – Lights out

## **Tuesday/Thursday**

8:00-8:45 – Breakfast at MSLC Dining Hall  
8:45-9:45 – Permafrost Permeability & Monitoring  
9:45-10:15 – Permafrost Impacts  
10:15-10:30 – Snack  
10:30-11:30 – Wolf Program  
11:30-12:15 – Who Should Be Saved  
12:15-12:45 – Lunch  
12:45-1:45 – Sled Dog Kennels  
1:45-4:45 – Mountain Vista Walk  
4:45-6:00 – Work on Create A National Park  
6:00-7:00 – Dinner at MSLC Dining Hall  
7:00-8:00 – Teacher Activities  
8:00-8:30 – Bedtime setup and wind-down  
8:30-9:00 – Lights out

## **Wednesday/Friday**

8:00-8:45 – Breakfast at MSLC Dining Hall  
8:45-10:15 – Work on Create A National Park and Snack  
10:15-10:30 – Create National Park Presentations  
10:30-11:00 – Closing Activity (Postcards)  
11:00-11:15 – Pack up gear and load gear on bus  
11:15-11:30 – Classroom & Bathroom clean up  
11:30-12:00 – Lunch

## Science School Instructor-led Activities

Denali Science School is instructed by both Denali Education Rangers and Alaska Geographic Educators. The Science School instructors conduct activities during specified times on the schedule. These placed-based, hands-on, multi-disciplinary, and fun activities focus on interdependence, systems, and stewardship. Most of the activities are conducted in or adjacent to the Murie Science and Learning Center, but four take place at special locations within the park:

### Horseshoe Lake Over-Look Hike

Students participate in multiple hands-on activities to learn, explore and get introduced to Denali's wildlife and habitats.

### Permafrost Monitoring

Students become scientists during a data-collection activity near the MSLC. The students witness first-hand the role that permafrost plays in the taiga ecosystem by measuring the depth and temperature of the active soil layer.

### Sled Dog Kennels

Students learn about and visit the only sled dog kennel in the National Park Service! The group learns and demonstrates the positions of a sled dog team and explores the adaptations (behaviors, forms, and functions) that make Denali's sled dogs well suited to living and working in the subarctic.



### Mountain Vista Hike

On this 1-mile walk, students get the unique opportunity to observe Denali's four main habitats. They observe and explore different habitats and organisms and discuss how they are interconnected.

## Teacher-led Activities

The true power of Denali Science School comes from the combined contributions of all of the educators who are involved. The program uses co-teaching model in which both the Denali Science School Instructors and the visiting teachers and chaperones lead educational activities. Educators are encouraged to be creative and use their experiences and skills to create new and meaningful opportunities for their students to connect with Denali.

Pre-site preparation by teachers is a crucial part of Denali Science School. Students who learn about Denali before their trip are better able to make tangible connections with what they previously learned. Additionally, the Denali Science School instructors can build on prior knowledge instead of covering the basics.

### **Pre-site Activity**

During their visit to Denali National Park and Preserve, students create their own national parks. In order for them to anticipate features they may want to include in their parks, and see examples of how parks communicate with visitors, please have the students complete the pre-activity, which is located in the Teacher Activity Guide. The two pieces of text that they review, “The Alpenglow” park newspaper and the park brochure, also give them some background information about the park (these materials are mailed to you in advance).

### **On-site Activities**

Teachers conduct activities during times specified on the schedule. Pre-made activities, including the materials needed to conduct them, are available at the MSLC and on Denali’s website. Educators can also choose to use their own curricula that they bring with them. All activities should have educational goals that are relevant to the systems and stewardship themes of Denali Science School.

### **Post-site Activity**

Throughout Denali Science School, students learn about interdependence within ecosystems and how Denali National Park and Preserve works to keep ecosystems intact. In the post activity, which you will find in the Pre, Post, and Teacher Activity Guide, students will consider a question after reading a thought provoking article.

- ❖ How can humans maintain a progressive lifestyle while having minimal impacts on the Earth’s natural resources?





# Registration and Agreement

## Registration

Two sessions of Denali Science School are available per week: Session I runs Monday through Wednesday and Session II runs Wednesday through Friday. Total group size per session is 30 students and 5 chaperones (teacher included) unless an exception is granted. Please ensure one chaperone for every six students. Small classes can combine together to form one large group. We may also combine classes during the registration process. Please complete one form per class if requesting multiple sessions. Registration is not guaranteed until you receive confirmation from the Denali education staff.

## Agreement

To participate in Denali Science School an agreement must be signed by both Denali National Park and Preserve and the participating school. The agreement clearly states the expectations and responsibilities of each organization:

### *NPS agrees to:*

- Inspire young Alaskans to explore, learn about, and protect Denali and other public lands.
- Provide all education programming while school group is visiting Denali except for pre-designated times during which the teacher is the lead educator. One or more NPS and Alaska Geographic educators instruct and accompany the group at all times except overnight and during meals.
- Provide a sleeping space in the Murie Science and Learning Center (MSLC) classroom and a secure place to store small valuables.

### *School agrees to:*

- Provide transportation to, from, and in Denali National Park.
- Limit total group size to 30 students and 5 chaperones (teacher included) and ensure a student to chaperone ratio of six to one unless granted an exemption. Students who are not part of the sponsored class may only participate with advance agreement.
- Purchase breakfasts, lunches and dinners from the MSLC Dining Hall, with payment due by the first day of the session.
- Sponsor the field trip to Denali and as such assume liability for students and chaperones during the entirety of the trip. Denali has 24-hour EMS personnel that assume authority during emergency situations. At all other times the lead teacher has ultimate authority over their students.
- Bring a standard school district medical form for each student, to be carried by the lead teacher and a chaperone at all times and made available to Science School educators or EMS personnel in emergency situations.
- Notify the Denali Education team in advance if there are any students who regularly need special assistance for behavioral, physical, or medical reasons.
- Ensure that the teacher and chaperones are responsible for managing student behavior and group dynamics and holding and administering student medications while in Denali.
- Return evaluation forms to MSLC at the completion of Science School.

# Preparation, Transportation, and Meals

## Preparation

Lead teachers must prepare students and chaperones, coordinate funding for transportation and meals, and communicate with parents, school administrators, and park staff.

## Transportation

Each school must arrange and pay for its own buses or private vehicles to, from, and in the park.

## Meals

Payment for meals is due by the first day of your session. Meals cost \$7.50 per person for breakfast, \$8.00 per person for lunch, and \$9.95 per person for dinner. For a group of 35 this translates to \$263 per breakfast, \$280 per lunch, and \$348 per dinner for a total of \$1,782 for the whole trip. These numbers are based on 2014 costs and might be slightly different in future years. You can pay with credit card, check, or cash. Payments are due in person on the first day of your session. No over the phone credit card payments are accepted. If you pay with a check, please have it made out to Alaska Geographic.

This is an outline of the planned food service for Denali Science School. Doyon/Aramark Joint Venture does its best to offer all of the items listed, but the menu is subject to change without notice if certain items become unavailable. Snacks including granola bars, trail mix, and fruit are also provided. With advanced notice we can accommodate special food needs related to many allergies and other health issues. However, we cannot guarantee the availability of special food items.

	Day One	Day Two	Day Three
Breakfast		Scrambled Eggs, Bacon, Sausage, Potatoes, Fresh Fruit, Cereal, Juice	Pancakes, French Toast, Bacon, Sausage, Fresh Fruit, Cereal, Juice
Lunch	Arrive Afternoon	<u>Sack Lunch (choose one of the following)</u> #1 – Turkey and Cheddar Sandwich #2 – Peanut Butter and Jelly Each lunch contains a sandwich, bag of regular potato chips, carrot sticks, and chocolate chip cookie and bottle of water.	<u>Sack Lunch (choose one of the following)</u> #1 – Turkey and Cheddar Sandwich #2 – Peanut Butter and Jelly Each lunch contains a sandwich, bag of regular potato chips, carrot sticks, and chocolate chip cookie and bottle of water.
Dinner	<u>Pizza Party!</u> Cheese, Veggie, and Pepperoni Pizza Caesar Salad Ice Cream Sandwiches	<u>Spaghetti</u> Spaghetti, Meatballs, Marinara Sauce, Steamed Veggies, Breadsticks Chocolate cake	

## Chaperones

Chaperones are an integral part of Denali Science School. They provide support to the lead teacher and help guide students. Chaperones are chosen by the lead teacher and can be parents, school staff, or other responsible adults. We require and limit group size to one adult supervisor per six students. This is because too many adults can be a distraction during the visit, but a minimum number is required to maintain a safe learning environment.

It is important that lead teachers impress upon their chaperones the responsibilities for the trip. Chaperones should be reminded to be active participants in all activities. Denali Science School is a learning experience for children and adults alike. If all adults are actively engaged and modeling attentive behavior, the students will follow. These additional guidelines encourage participation and cooperation from chaperones to ensure a successful experience:

- Help keep the group's attention focused on what the Denali Science School Instructor or lead teacher is saying and encourage students to answer.
- Actively guide and encourage students during activities.
- Watch over their group to ensure everyone is safe.
- Help enforce rules.
- Parents of participating children should treat all students with equal attention.



## Gear

Participants should pack clothes that can be layered to accommodate variable weather conditions. Clothes and shoes should be comfortable and easy to walk in for long periods of time. All participants, including adults, must wear long pants, socks, and closed-toed shoes at all times when outside. Participants should also come prepared for rain and cold weather.

In September and early October, Denali tends to have average high temperatures in the 40s and 50s and average lows in the 20s and 30s. Students should plan to be outdoors for considerable portions of Denali Science School, and will likely be most comfortable wearing long sleeves and a light jacket or sweatshirt. Please ensure participants wear/bring the following items that can pack into **one bag**:

- Sleeping bag
- Sleeping pad
- Two sets of clothes appropriate for recreating outside – wear one, pack the other
- Sweatshirt or fleece jacket
- Extra warm socks- **not** cotton, preferably wool or synthetic/wool blend
- Sneakers or hiking boots (no sandals or open-toed shoes)
- Warm jacket
- Warm hat
- Mittens or gloves
- Rain coat
- Rain pants
- Personal items: toothbrush, toothpaste, comb, small hand towel, etc.
- Water bottle (non-leaking and closeable)

### *Optional:*

- Small pillow
- Stuffed animal, book, or journal

### **Double check:**

- That all items pack into **one bag**.
- No extra snacks in students bags.
- No phones, radios, electronic games, or toys are allowed.

### **What Not to Pack**

Lead teachers should communicate with parents and guardians about what not to send with the students. As with any school field trip, items prohibited in school are also not permitted at Science School. Less obvious items that can create distractions include cameras, electronics, and cell phones. Students may be disappointed to learn that we discourage cameras, but we want them to fully experience Denali through their own eyes. Adults are allowed to bring cameras and take pictures for the group. Electronics such as music and game players should not be brought to Denali Science School. The trip is a chance to unplug and enjoy the other participants in the group. Students should not bring cell phones. In case of an emergency, the group will always be reachable.

## Rules and Safety

Denali is a novel and exciting environment for students. A pre-visit discussion of park rules provides a framework that will make the experience more enjoyable for everyone. National Parks are dedicated to preserving and protecting wildlife, plants, and other features for future generations.

### Expectations

- Respect Wildlife – Feeding or harassing wildlife in the park is illegal.
  - Stay at least 300 yards away from a bear.
  - Stay 25 yards away from any other wildlife.
- Respect Plants – Picking flowers or breaking off leaves damages plants. Collecting any natural object is not allowed in Denali or any National Park.
- Respect Each Other – When an adult is talking or a student is answering a question, everyone should listen.

### General Rules

- A ratio of one adult for every five students must be maintained at all times.
- Long pants, socks, and closed toed shoes must be worn outside at all times.
- Chaperones supervising small groups are responsible for keeping their group together.
- Use the proper garbage and recycling can for waste.
- Unplanned visitors to Denali Science School are not permitted. Other visitors must be approved by park staff.

## Emergencies

### In Park

Denali has a 24-hour Communication Center that can be reached by phone to request emergency assistance. The Communication Center number is 907-683-9555.

### At Home

In case of emergencies at home or needing to get a message to a child, parents can call the lead teacher's cell phone number or the Denali Communication Center. Please emphasize to parents that the park number is only for significant emergencies.





## Pre-visit Check-in and Post-visit Evaluation

### Pre-visit Check-in

Approximately two weeks before your session, a Park Service Education Ranger will contact you to discuss scheduling and logistics and to answer any questions. Additionally, they will want to know if the group has any special concerns or needs.

### Post-visit Evaluation

In an effort to continually improve our programs, we require feedback from all participants. An evaluation will be sent to all participating school groups of Denali Science School.



